

PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Sequestration

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LANDFILL GAS SEQUESTRATION IN KANSAS

Background

Most methane (CH_4) generated by anaerobic decomposition of the organic material in solid-waste-disposal landfills is either vented to the atmosphere or converted to carbon dioxide (CO_2) by flaring. In 2001, U.S. anthropogenic methane emissions totaled 28.0 Mt (1.3 trillion cubic feet - Tcf). Landfills are the single largest source of these emissions, totaling 8.14 Mt (0.38 Tcf) or 29%. Overall, methane emissions account for about 9.3% of the total U.S. greenhouse-gas emissions when weighted by methane's global warming potential factor. Gas-to-energy projects, including upgrading landfill gas (LFG) to pipeline natural gas, are eligible for an "unconventional gas" tax credit. However, this tax credit provides insufficient incentive for development of new LFG-to-energy projects. Unless methane recovery from landfills increases, the increasing tonnage of a landfill waste will result in high levels of methane emissions from this source in the future.

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The Kansas Geological Survey will address the gas-processing cost issue by investigating the possibility of injecting LFG into subsurface coalbeds, thus utilizing natural processes to produce larger quantities of higher quality gas by stripping and sequestering CO_2 and non-methane volatile organic compounds out of the LFG onto the surface of a coal seam. About 4.5 million cubic feet of landfill gas is collected through wells in the Johnson County Kansas landfill each day. About half of the landfill gas is methane and the other half is largely carbon dioxide. The methane is separated out of the LFG, cleaned and injected into a pipeline for distribution.



Landfill gas from the Johnson County Landfill is pumped to a gas treatment and processing facility to separate the methane from carbon dioxide and other non-methane compounds. Currently, approximately 5 million cfd of landfill gas is treated daily which results in about 3 million cfd of pipeline quality natural gas. The outcome of this project could eliminate such processing facilities by using natural coalbeds to perform the methane separation and sequester the CO_2 component of LFG. (reference: Johnson County, Kansas Environmental Department)



CUSTOMER SERVICE**1-800-553-7681****WEBSITE****www.netl.doe.gov****PARTNERS****Kansas Geological Survey****Kansas University Energy Research Center****Deffenbaugh Industries****Kansas City LFG, LLC****Oak Ridge National Laboratory****COST****Total Project Value**

\$130,899

DOE/Non-DOE Share

\$86,408 / \$44,491

The geology of the Johnson County landfill will be evaluated to determine structure, stratigraphy, and depth and thickness of underlying coal seams. Coals will be obtained and their properties and reservoir conditions ascertained. The physical response of the coal to LFG gas at reservoir conditions will be performed. From these data, reservoir simulations will explore the economic potential for the dual benefit of carbon sequestration and enhanced coalbed methane (ECBM) recovery. A listing of major U.S. landfills overlying coal-bearing strata will be developed, and the feasibility for this type of linked energy system will be rated.

Primary Project Goal

The primary project goal is to experimentally study the reservoir mechanisms and feasibility of subsurface processing of LFG using coal seams and, in exchange, sequester the CO₂.

Objectives

Project objectives are:

- The collection and laboratory testing of coal-bearing cores from underneath a major urban landfill.
- Testing of coal bearing cores from underneath a major urban landfill.
- Experimentally studying reservoir mechanisms.
- Evaluating the feasibility of subsurface processing of LFG using the coal seams that are located under the Johnson County Landfill in eastern Kansas.

Benefits

The project will decrease fugitive greenhouse gas emissions (both methane and CO₂) by sequestering CO₂ and providing methane for home heating, industry, and uses. Working with the EPA will help DOE to assess the role that non-CO₂ greenhouse gas emissions abatement can play in a nationwide strategy for reducing greenhouse gas intensity.